IS 6213-8 (1973): Methods of test for pulp, Part 8: Beating, sheet making, preparation of hand sheets and testing [CHD 15: Paper and its products]

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IS : 6213 (Part VIII) - 1973

Indian Standard

METHODS OF TEST FOR PULP

PART VIII BFATING, SHEET MAKING, PREPARATION OF HAND SHEETS AND TESTING

(First Repring JANUARY 1986)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2 *December* 1973

ANENDNENT NO. 1 APRIL 1982

TO

IS:6213(Part VIII)-1973 METHODS OF TEST FOR PULP

PART VIII BEATING, SHEET MAKING, PREPARATION OF HAND SHEETS AND TESTING

Addendum

(*Page 8, clause 4.6*) - Add the following new clauses after 4.6:

'4.7 Folding Endurance - Carry out the test according to 12.6. of IS:1060(Part I)-1966*

4.8 Apparent Density - Calculate the apparent density of the sheetsas Follows:

Apparent Density, g/cm^3 = $\frac{\text{Substance in grams per square metre}}{\text{Average thickness of a single sheet in microns}}$

AMENDMENT NO. 2 DECEMBER 2011
TO
IS 6213 (PART 8) : 1973 METHODS OF TEST FOR PULP

PART 8 BEATING, SHEET MAKING, PREPARATION OF HAND SHEETS AND TESTING

(*Page* 8, *clause* 3.2) — Substitute the following for the existing clause:

'**3.2 Pressing —** Press the hand sheets stack in the standard press by raising the pressure to 350 kN/m^2 (approx. 3.5 kgf/cm^2) in half minute and maintaining it there for 5 minutes. Release the pressure and remove the press cover. Remove the stack from the press. The test sheets should now be adhered to the polished plates so that the blotters can be gently peeled away and discarded. Place a dry blotter on the press using the press template as a guide centre for each plate, with the test sheets facing up, in the press. Place a dry blotter on top of each sheet. Place the cover of press in position, raise the pressure to 350 kN/m^2, maintain the pressure for two minutes, and then release it. Remove the stack from the press.'

(CHD 15)

Reprography Unit, BIS, New Delhi, India

Indian Standard

METHODS OF TEST FOR PULP

PART VIll BEATING, SHEET MAKING, PREPARATION OF HAND SHEETS AND TESTING

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Indian Standard

METHODS OF TEST FOR PULP

PART Vlll BEATING, SHEET MAKING, PREPARATION OF HAND SHEETS AND TESTING

0. FOREWORD

0.1 This Indian Standard (Part VIII) was adopted by the Indian Standards Institution on 30 March 1973, after the draft finalized by the Paper Sectional Committee had been approved by the Chemical Division Council.

0.2 For obtaining good quality of paper, it is essential that the pulp which goes into the manufacture of paper is properly cooked and. bleached. Formulation of this standard had been taken up in order to guide the people working in pulp and paper mills for the methods to be adopted for pulp analysis.

0.3 For forecasting the strength of paper to be produced from pulp and for comparison of different types of pulp it is essential to carry out physical tests on sheets of pulps. For the test to be reproducible and the comparison to be meaningful it is essential that pulps are subjected to exactly the same type of beating and sheet making treatment before these tests are carried out. This standard, therefore, lays down details of the equipment and the procedure to be followed for above operations and the physical tests to be carried out on sheets.

0.4 in reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2 - 1960*

1. SCOPE

1.1 This standard (Part VIII) prescribes the procedure tor beating, sheet making, preparation of hand sheets and physical testing of pulp.

*Rules for rounding off numerical values (*revised*).

9. BEATING OF PULP

2.1 Apparatus

2.1.1 *Disintegrator* — The disintegrator consists of a cylindrical metal container in which a three-blade propeller driven by a 200-watt motor revolves in the centre. The speed of the piopeller should be 3 000 rev/min. On the inside surface of the container arc 4 equally spaced, gun metal spiral baffles so arranged as to oppose any tendency for the pulp to be thrown out by centrifugal action. The cylinder ran be removed for emptying purposes by raising the propeller shaft through its bearing.

2.1.2 *Beater with Controlled Bed Plate*

2.1.2.1 It consists of a bed plate and roll made of stainless steel (chromium 11.5 to 13 percent), The roll has a diameter of 168 mm and the diameter of the roll with flybars inserted is 194 mm. There are 32 beater knives of 4 to S mm thickness. The width of roll is 152 mm. The Brinell hardness of the beater knives is 350 to 400 and that of bed plate bars 325 to 375.

The bed plate has 7 bats each 3.2 mm thick and spared 2.l mm apart. These are bent into a V-shaped for having an angle of 5° with the roll axis; with the apex of the 'V' pointing in the direction of movement of stock over the plate. The grooves between the bed plate bars are filled with white oak strips. The projected length of the bed plate is 159 mm and its projected width is 43 mm. The bed plate fulcrum shaft is located paraliel to the axis of the roll. The lever arms of the controlled bed plate have a ratio of 17.5 to 9. The diaphragm is of 1.6 mm thick rubber. The roll is driven at 500 rev/min by a 400 watts, 1 200 rev/min motor with suitable belt and pulley arrangement.

2.1.2.2 *Calibration of beater and precautions* — The bars and bed plate of the beater should be kept in good condition. Whenever the bed plate is removed from the beater it should be reground because removal and replacement of bed plate disturbs the smooth fit of the beating surface.

In order to grind the beater it is necessary that the bed plate be held in a fixed position relative to the roll. The position of the bed plate in relation to the roll is adjusted by two machine screws, which hold the bed plate lever in a fixed position.

For grinding the beating surface, place 250 g of 120 mesh emery powder in a charge of stock circulating in the beater tub. The first adjustment should be to bring only the high Joints of the roll and

bed plate in contact, as indicated by the sound. Proceed with the grinding, gradually adjusting the bed plate up to the roll allowing the high irregularities to be removed before making closer adjustment. When further adjustment of bed plate fails to produce vibration of bed plate, remove the abrasive and wash the beater. If the roll is well ground, the beater will run smooth on the bed plate with water only.

After each test the beater should be well cleaned from the accumulated pulp stock.

It is also essential that the beater is checked for its arcuracy by calibrating the equipment at least onre a month with a sample of pulp from a portion of a bale kept for reference purposes.

2.1.3 *Sheet Making Machine* — As shown in Fig. 1, it consists of a metal cylinder open at both ends which can be fixed verlically over a circular grid plate in such a way that the latter forms the base of the cylinder and no leakage of water occurs at the circumference. The cylinder is hinged to the edge of the frame which holds the grid plate and it may be clamped to the latter when in position. The grid plate consists of 150-mesh wire gauze mounted on a cireular fiame work and supported underneath on a 20 mesh wire below which is a metal casting perforated by square holes of size 11 9 mm which taper from the top to the bottom. The lower portion of the grid plate fits snugly into the top of a hollow, cup-shaped metal funnel, at bench level, the stem of which leaves the cup at its lowest point and is continued beneath the bench as a vertical drain pipe 31.8 mm in diameter. A removable 101.6 mm fine baffle under the grid plate and over the drain pipe serves to counter any tendency to swirl.

The diain pipe terminates in a sump surrounded by a cylindrical overflow chamber. It has a drain cork near the lower end with a water inlet just above it. A needle valve just beneath the bench level allows access of air to the pipe when required. The height from the top surface of the overflow to that of the wire is 800 mm.

A stirrer with a perforated horizomal plate is provided.

2.1.4 *Press* — It consists of a heavy base and a cover made of close-grained cast iron. The former houses a heavy circular diaphragm, and a brass ring holds it in position and at the same time accommodates a flat, circular brass plate which floats on the diaphragm. In the cover which is counterpoised to assist manipulation is another brass plate, and the action of the press takes place between these two plates. The cover is held in position by means of four threaded uprights passing through hoses in it provided with nuts and seemed at their lower ends to the base. Below the diaphtagin is a reservon containing glycerine,

which is connected to a gun metat plunger pump operated by means of a screw and a bronze thrust washer. This transmits its pressure through the glycerine and rubber diaphragm to the brass plate resting on the latter, the sheets of pulp being placed between this plate and the corresponding plate in the cover.

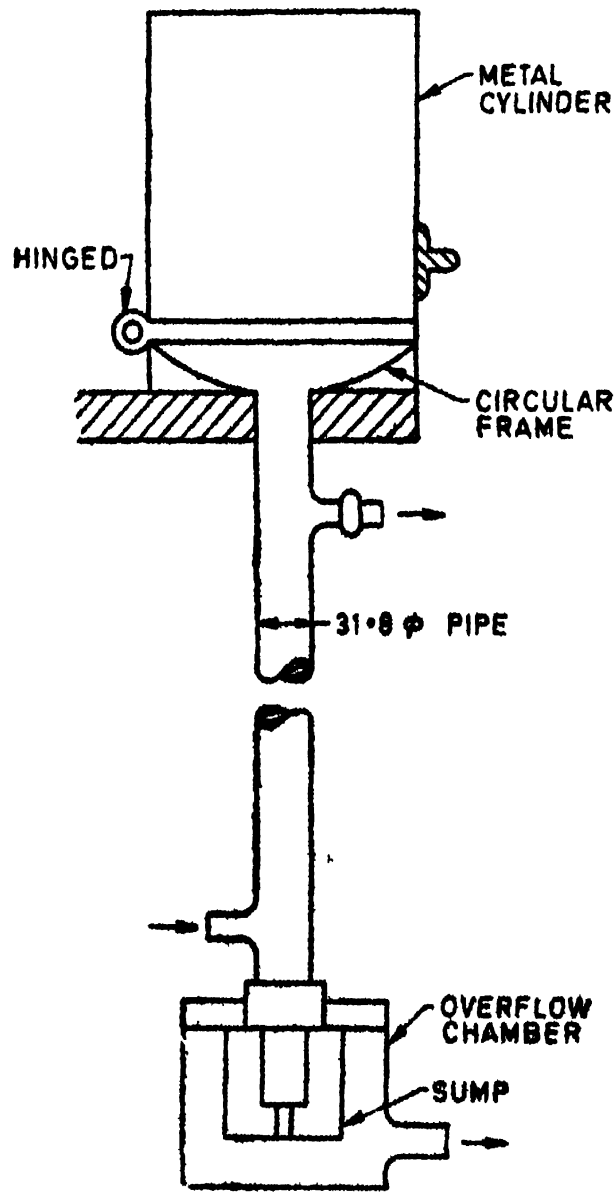

FIG. 1 SHEET MAKING MACHINE

2.1.5 *Drying Rings*

2.2 Procedure

2.2.1 Weigh exactly 360 g of the representative sample of moisture-free pulp. If the same is dry, soak it for 4 hours and tear into small pieces.

Disintegrate the pulp in the disintegrator for 10 minutes in 4 batches of 90 g each with 2.5 litre of water each time and add to the beater. Add enough cold water so as to make the total volume of slurry to 23 litres at 27 ± 2°C. Circulate the pulp for 5 minutes without pressure between the roll and the bed plate.

In case of ???ag fibres which cannot be disintegrated in the disintegrator, it is advisable to cut them in a Hollander beater and then load the beater for beating.

2.2.2 *Removal of Sample and Beating* — Withdraw 800 ml of sample from (12.5 g of moisture-free fibre) the unbeaten sheets and add a 5.5-kg weight to the bed plate lever arm. Note the time the weight is added at the commencement of beating operation. Withdraw 3 additional 800 ml samples at successive time intervals and then drain the beater, Recharge it as before and take additional samples after the third from this beater.

Even though all the quantity of pulp withdrawn be not used for the test sheets, it is desinable particularly if it is intended to compare the results with other tests, to withdraw the stated quantities of pulp at different time intervals, so as to maintain a uniform rate of beating.

2.2.3 *Disintegration and Dilution* — Dilute each 800 ml to 2 litres (0.62 percent consistency and disintegiate each sample including that of the unbeaten pulp for 15 000 revolutions (5 minutes) in the disintegrator. Dilute the stock to 8.5 litres 0.15 percent consistency) and make hand sheets.

3. PREPARATION OF HAND SHEETS

3.1 Sheet Making

3.1.1 Partially fill the sheet machine container with water, run the water till the water is just above the level of the wire so that the air below the wire is driven off. Take 800 ml of the well mixed stock at 0.15 percent consistency and turn on the water supply simultaneously in the sheet machine so that the level of suspension rises to 35 cm mark above the wire.

3.1.2 Insert the perforated agitator and in 6 seconds move it steadily up and down 6 times keeping the disk beneath the level of the liquid. Repeat this movement once in 10 seconds and gently withdraw the stirrer. Open the drain cock after 10 seconds and let all the water drain from the sheet under suction. Tilt the cylinder after drawing the water and couch the sheet of the wire with the help of a filter paper. Wash the wires of the sheet machine and similarly prepare other sheets.

3.1.3 The ultimate object is to get sheets each weighing between 1.14 and 1.26 g moisture-free, corresponding to a grammage of 60 g/m^2 with a tolerance of 5 percent. Consequently for a finely divided pulp; slightly more than 800 ml of stock should be added, for example 840 ml for an average ground wood pulp to allow for a 5 percent fibre loss through the wire.

3.2 Pressing — Press the sheets in the standard press by raising the pressure to 350 kN/m^2 (approx 3.5 kgf/cm^2) in half minute and mamtain it there for 5 minutes. Release the pressure and remove the cover.

3.3 Drying — Attach the test sheets in the drying rings and dry them in an atmosphere maintained at 63 ± 2 percent relative humidity and a temperature of 27 ± 2°C.

4. PHYSICAL TESTING OF HAND SHEETS

4.1 Conditioning — The hand sheets shall be conditioned for a period of 4 hours in a room maintained at 65 ± 2 percent relative humidity and 27 ± 2°C temperature. All the tests indicated below shall also be carried out in this room.

4.2 Grammage — Determine the average grammage of the conditioned sheets by weighing together a number of sheets of equal area on a balance weighing accurately to 0.01 g. Calculate grammage as follows:

$$\text{Grammacce in} = \frac{10\,000\ M}{A\ N}$$

where

M = mass in g of N sheets,
A = area in m^2 of each sheet, and
N = number of sheets.

4.3 Thickness — Carry out test according to **7** of IS : 1060 (Part I) - 1966*.

4.4 Bursting Strength — Carry out test according to **12.5** of IS : 1060 (Part I) - 1966*.

4.5 Tensile Strength — Carry out test according to **12.3** of IS : 1060 (Part I) - 1966*.

NOTE — Set the jaws of the tensile tester 90 to 100 mm apart and increase the load uniformly at the rate of 4.5 ± 1.5 N/second (approx 0.45 ± 0.15 kgf/second) until fracture occurs.

4.6 Testing Strength — Carry out the test according to **12.7** of IS : 1060 (Part I) - 1966

*Methods of sampling and test for paper and allied products, Part I (*revised*).

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